

Goal 1: Air

Story 1:

WORKSHOP OF ENERGY EFFICIENCY IN MUNICIPAL PUBLIC LIGHTING SYSTEMS OF TAMAULIPAS

Energy efficiency in Mexico has become a strategy for the government, not only at the federal level but the state and local level as well, to improve and build long term sustainability within their public buildings but also enhance security of their energy supply while minimizing the impact to the environment. The operation of public lighting systems and the consumption of energy in public buildings and installations represents one of the greatest expenses faced by municipalities, sometimes reaching up to 40 percent of their costs federal participations. This factor limits the ability for local government to focus on other priorities and efforts. Through a border grant, the State of Tamaulipas' Ministry of Urban Development and Environment held two training workshops on energy efficiency, to 10 border municipalities within the state, on the basic tools needed to achieve greater energy efficiency in their lighting public spaces, thus increasing their economic savings and reducing their emission impact to the environment.

The workshops held were part of a series of actions to improve energy efficiency in the state, including two energy forums: "**First State Energy Forum: Tamaulipas, Energy that moves to Mexico**" and the **III International Congress on Renewable Energies: "Perspectives of Energy in Mexico"**. At the same time this project was implemented, the State launched a demonstration wind project which included the start of operations of four wind turbines, again with the aim to promote the use of renewable energies the State. The State also distributed over 10,000 guides "Practical Guidelines for Energy Savings", to help raise awareness to the communities regarding the benefits of installing environmentally friendly technologies in their homes.

As a result of the workshops, the commitment to carry out an energy audit in a building of the participating municipalities was obtained, it is estimated that the beneficiary population within the 10 municipalities amounts to 1 million 733 thousand 240 inhabitants.

Story 2:

Healthy and Resilient Housing in the western area of Ciudad Juárez, Chihuahua.

The low-income families often face limited access to resources that encourage energy and water savings for their homes. This is often due to either a lack of knowledge, technical

assistance or financial resources available to them, as well as the lack of access to financing that meets their needs, limiting the penetration of clean energy technologies and services that have less impact on the environment. The Mexican Federation of Private Associations of Health and Community Development A.C. (FEMAP) has been operating a Micro-Credit Program in the region for more than 30 years, during which time it has granted more than 40,000 small loans to low-income residents for the improvement of their homes.

With the support of the Border 2020 Program, FEMAP developed a project to identify and implement green infrastructure elements and energy saving elements to low-income families looking to improve their homes within an area of Ciudad Juárez which has seen rapid growth. The project focused on offering technical and financial assistance to 50 homes (202 persons) implementing these eco-elements. In coordination with academic, non-profit and private business, the residents had access persons who guided and educated them on green infrastructure elements that could be incorporated and adopted, as well as, access to eco-friendly materials..

The project resulted in an energy cost savings of \$ (USD) or XXKwh and water savings of 140,000 gallons of water or \$8,542 pesos (~500 USD) following improvements of the 45 of 50 homes by:

- the installation of over 250 led bulbs;
- over 200 window sealed;
- 50 low-flow shower heads;
- 50 drinking water filters;
- roof and wall insulation and installation.
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During the home improvements, families visits from trained supervisors and technical experts to offer assistance and guidance, as well as, educational material on eco-technologies and elements for homes.

In addition to the improvements made directly to the homes, a Catalog of Ecotechnologies was developed with the support of academics of the Architecture Program from the Autonomous University of Ciudad Juárez. This catalog includes information on best practices and an evaluation of each of the selected ecotechnologies, identifying those that are viable for implementation in marginalized communities since the existing catalogs are mainly focused on new housing.

Goal 2: Water

STORY 1:

BPUB: Fat, Oil and Grease Public Outreach Campaign

The Brownsville Public Utilities Board (BPUB) was awarded a Border 2020 grant for \$25,000 in February 2016 to provide outreach and education on the impact of Fat, Oil and Grease (FOG) pollution on water quality to the communities in Brownsville, Texas and Matamoros, Tamaulipas. Historically, at the BPUB, FOG residential and commercial service calls occur on average five (5) times a week, with increased occurrences during the month of December. Additionally, BPUB entered into a voluntary reduction program with the Texas Commission on Environmental Quality (TCEQ), Sanitary Sewer Overflow Initiative.

This voluntary program requires BPUB to work on reducing unauthorized discharge of untreated or partially treated wastewater from the collection system or its components (e.g. manhole, lift station, or cleanout) before reaching a wastewater treatment facility as a result of FOG issues.

Through educational campaign efforts to both the general public and to commercial establishments, the BPUB aimed to bring awareness about the proper disposal techniques in dealing with Fat, Oil and Grease; therefore, reducing the number of sanitary sewer overflows and the potential health hazards associated with the FOG pollutants. The project staff also aimed to reduce the number of FOG related service calls the BPUB received in 2016 by approximately 10-20% or 40-80 service calls from their 2015 related service calls.

Marketing & Education efforts:

On March 16, 2016, the BPUB officially kicked-off it's "Fat, Oil and Grease" public outreach campaign at its monthly public meeting in Brownsville. During the public meeting, they announced their collaboration with the City of Matamoros on the new FOG outreach program. BPUB staff set out to reach both communities through a number of activities that included educational fliers, videos, workshops, press coverage and program promotion. By advertising on television, newspapers, internet, radio and billboards, the BPUB was able to reach citizens from both sides of the border. Social media platforms such as Facebook, Twitter and YouTube (https://www.youtube.com/watch?time_continue=55&v=AL8PFo3SAtc), were also utilized to target younger audiences and share the educational video and audio campaigns that were developed. Throughout the project period, over 84 public outreach events and trainings (1,713 participants) were conducted to the public in apartment and housing complexes, churches and educational institutions, as well as, commercial business.

More importantly, the BPUB through its outreach efforts has consistently been reducing the number of FOG service calls from 731 (2013 yr) to 417 (2016 yr), a 43% reduction in just four years. During the project period, in 2015 and 2016, the BPUB received 477 and 417 services calls related to FOG pollutants, respectively. Overall, the project met its objectives, including, reducing the number of FOG related calls approximately 13% or 60 calls. To continue to learn more about BPUB's FOG efforts visit: <http://www.brownsville-pub.com/departments/water-wastewater/pretreatment>

STORY 2:

GREEN INFRASTRUCTURE IN THE VALLE DEL SOL AVENUE PUBLIC SPACE

The border region of El Paso and Juárez experiences a marked deficit of urban green spaces (UGS). The World Health (WHO) established a sustainability indicator of 9 m² per inhabitant, where Juárez is estimated to only have 4.5 m² of green area per inhabitant. Since 2013, Juárez has actively been partnering with various organizations to increase green infrastructure and expand green spaces throughout the city. These projects not only can be cost-effective but can address flooding issues associated with a lack of stormwater infrastructure and beautify areas that see high pedestrian traffic.

In 2016, a Border 2020 grant helped fund a park located on Valle del Sol Avenue and Solares Street, located less than 1 km away from the borderline and was is the only green space in the area available to the community for use. Over many years, the park had heavily degraded due a lack of maintenance and no longer served as an area where the community members could gather. The Instituto Tecnológico de Ciudad Juárez who received the border funding transformed the park back to a usable space for community members, but also addressed flooding issues that this area experienced during rain events.

With funds granted by the Border 2020 Program, the Technological Institute of Ciudad Juárez developed this project with the following objectives:

- Establish passive rainwater harvesting systems;
- Conserve water used for watering;
- Protect the soil from wind erosion;
- Incorporate and take advantage of the existing urban infrastructure.

The project began in June 2016 with the cleaning of the site and the reconditioning of the sidewalk, the construction of passive systems for rainwater collection, as well as the recovery and reconfiguration of existing vegetation. The amount of rainfall was monitored over 17 months, starting in July 2016 and ending in November 2017. In total a volume of 472, 502 U.S. Gallons of rainwater was captured.

Due to the passive water collection systems, the system continues to function effectively and the vegetation planted has done well. Currently, the park is supported almost entirely with rainwater except in cases of extreme water stress or for the initial support of some new plant element.

Thanks to a donation from the municipal authority, the park soil is protected from wind erosion, by a walnut shell cover, which allows any moisture in the soil to be conserved.

Finally, surveys conducted in the area showed that the social value of the park increased substantially, where before the project the space was a negative area within the community, now it is seen as a usable social gathering park.

STORY 3:

Determining the Ideal Bioswale Porous Material for South Texas Stormwater Management

Source: Final Project Report by Dr. Ho, Ph.D.

A number of communities in the Lower Rio Grande Valley in south Texas have been evaluating various Low Impact Development (LID) methods to incorporate into their communities. There are several advantages that LID provides versus traditional stormwater management practices such as: reducing or eliminating the need for large retention ponds; reducing pollution to receiving waters; reducing erosion; visually more appealing within the community; flexibility in the layout of LID projects and can cost less. A research team under the direction of Dr. Jungseok Ho, of the University of Texas Rio Grande Valley (UTRGV), evaluated the use of bioswales in parking lots in order to help determine the best performing locally available bioswale porous media material and design a bioswale standard that could be used by communities in the region. Bioswales are generally designed to manage runoff from large impervious surfaces such as parking lots. Bioswales incorporate engineered porous soils and/or other landscape elements to remove debris and pollution from surface runoff.

Building on previous studies Dr. Ho had conducted, his team evaluated five testing sites (Table 1) that utilized various bioswale porous media (no bioswale, pumice, manufactured sand, recycled crushed glass and natural sand) in parking lots on the UTRGV Edinburg campus.

Table 1. Bioswale porous media materials and parking lot drainage size

Sampling Sites	Bioswale	Porous Materials	Drainage Size (acres)
Site 1	No bioswale	No bioswale	.237
Site 2	Bioswale 1	Pumice	.216
Site 3	Bioswale 2	Manufactured sand	.218
Site 4	Bioswale 3	Recycled crushed glass	.209
Site 5	Bioswale 4	Natural Sand	.206

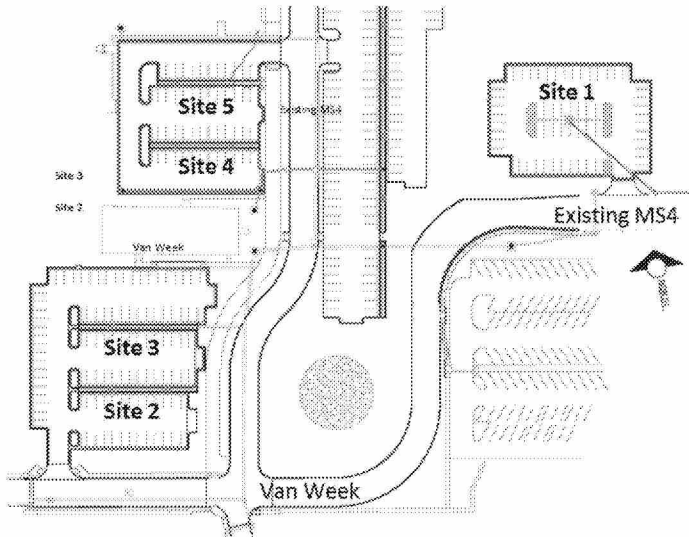
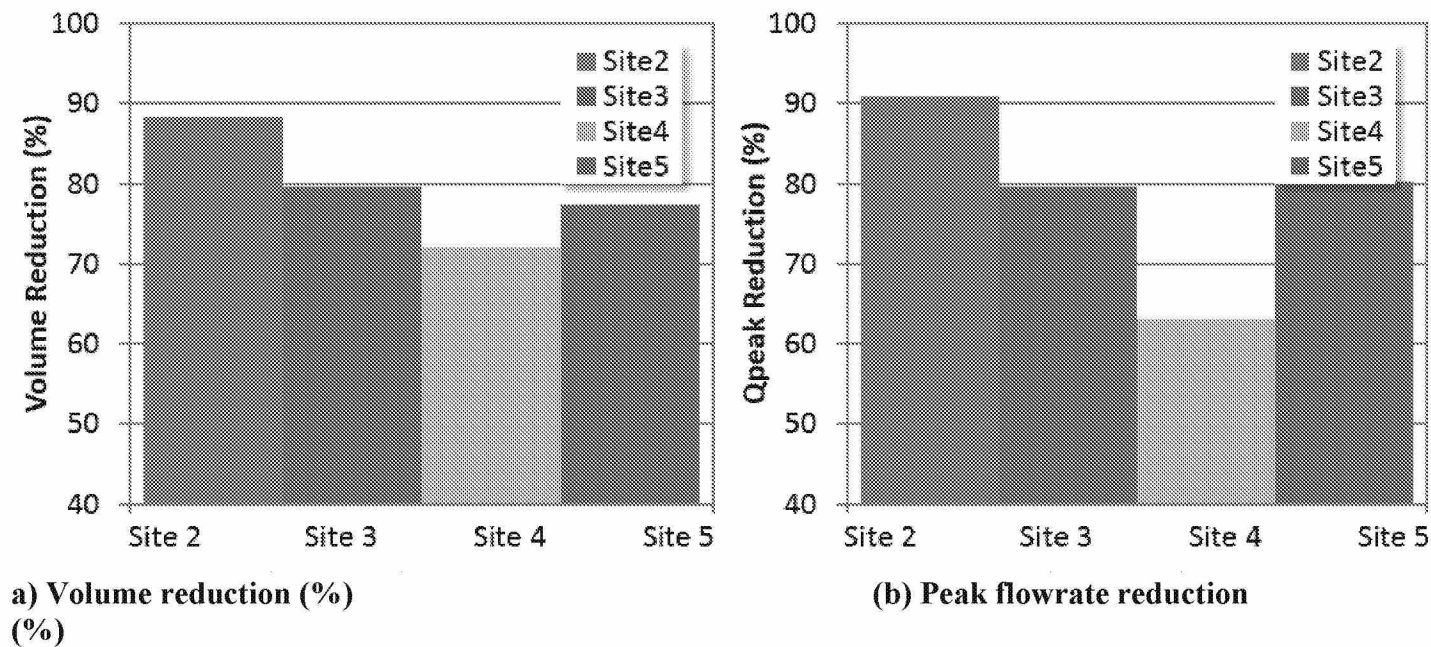
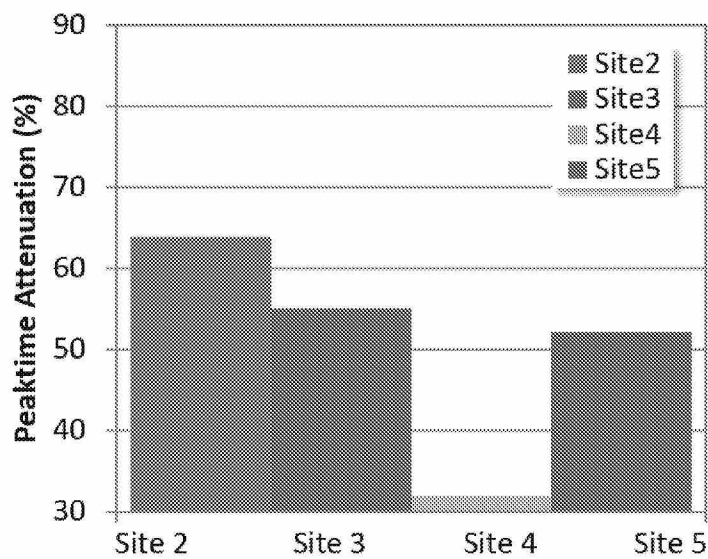


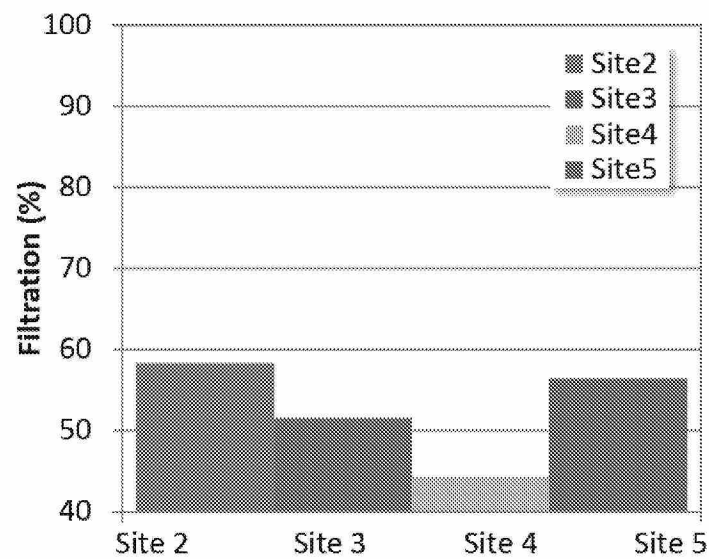
Figure 1. Bioswale parking lots located North of Van Week Street in UTRGV campus

Figure 2 indicates the hydrological performance of the four different materials used at the five testing sites. Field testing indicating, Site 2 with the Pumice material, showed the best hydrologic performance taking into account the four decision criteria of runoff volume reduction, peak flowrate reduction, peaktime attenuation, and runoff solids filtration. Pumice showed the highest filtration of the materials with 58% (Figure 2d) and a peaktime attenuation of 64% (Figure 2c). Manufactured sand material showed very similar performances with natural sand material among the volume reduction, peak flowrate reduction, and peaktime attenuation. Recycled crushed glass was also a competitive material for all the criteria except peaktime attenuation which was only 32%.





(c) Peaktime attenuation (%)



(d) Filtration (%)

Figure 2. Bioswale parking lot hydrologic performances of volume reduction, peak flowrate reduction, peaktime attenuation, and filtration

The soil column test (Figure 3) results show that any mixtures containing pumice more than 40% of the volume produced very good promising results. Three 40% pumice mixtures (with manufactured sand, natural sand, and recycled crushed glass) achieve 29.7% of specific retention and 52.4% of filtration in average.

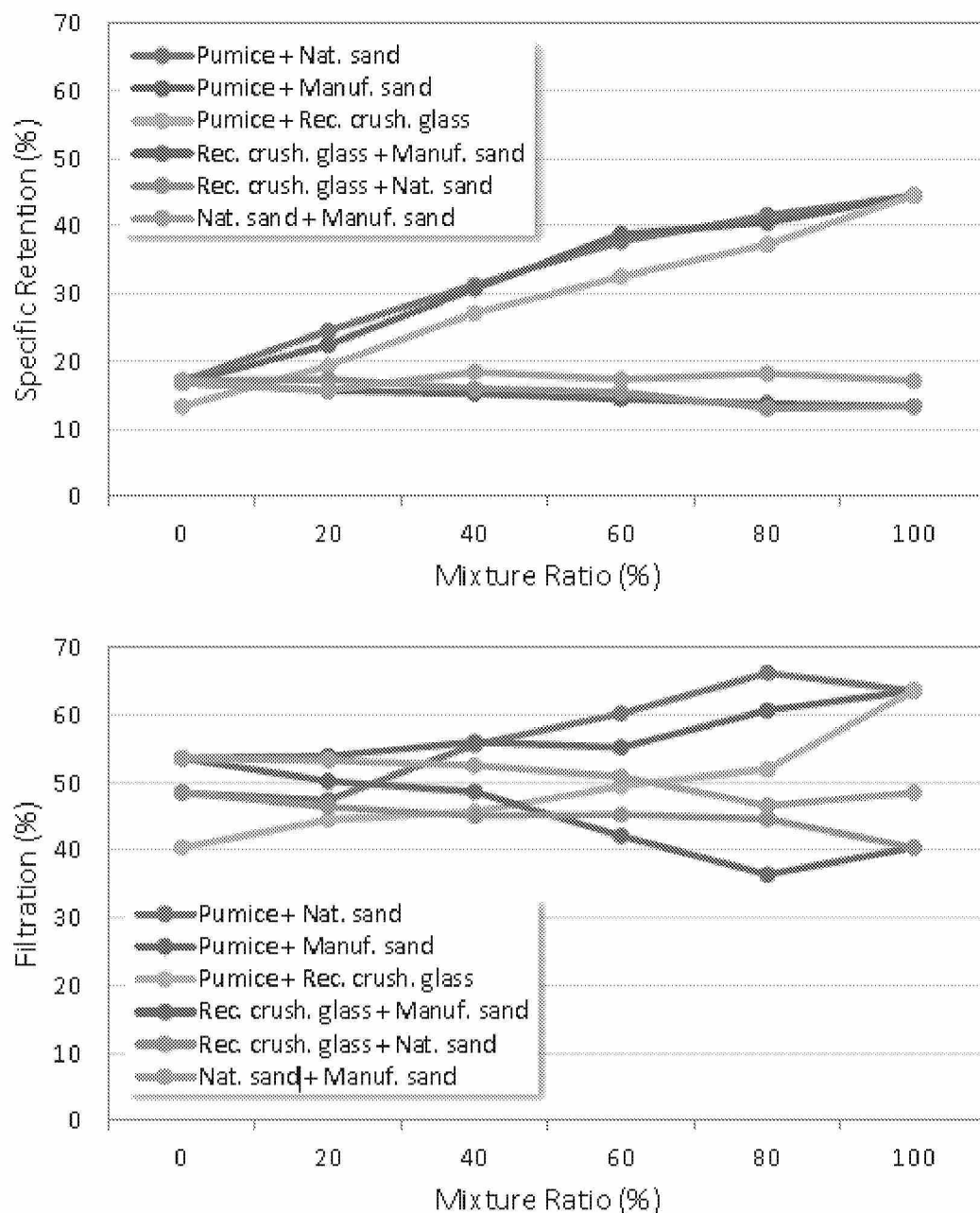


Figure 3. Laboratory experiment results of specific retention (%) and filtration (%) of the bioswale mixtures

Overall, based on the field testing, pumice performed the best of the bioswale porous medias, with testing showing that at least 40% pumice material mix is the ideal material for this region. However, it should be noted that further studies need to be conducted to consider the local availability, cost of the material and project construction to determine the overall practicality to be used by the communities.

Goal 3: Waste

Story 1:

Scrap Tires and Solid Waste Management along the U.S.-Mexico Border

The Border 2020 Program has aimed at building a more sustainable, integrated approach to waste materials management in order minimize and/or reduce the impact to the environment and improve public health. However, in a geographic region where population, socio-economic conditions and environmental regulations can vary significantly from one region to another, different border communities have had to take varying approaches to building sustainability within their own communities.

City of Pharr, Texas

Over the years, the City of Pharr has been able to implement greater sustainability tools within the Public Works Department to help make the city one of the cleanest cities in the Lower Rio Grande Valley. In 2016, Pharr received a B2020 Program grant for \$36,390 with the goal to continue to improve their recycling and education efforts within the community in order reduce the city's dependency on landfills and build a healthier community. Through the grant, over a 14-month period, the city collected:

- over 5,700 scrap tires;
- 60 tons of mixed waste (Figure 1);
- 1,023,353 lbs of recycled material was diverted from the landfill.

Staff from the department launched a bilingual outreach public education campaign by promoting, the city's recycling and sustainability efforts, stormwater pollution and illegal dumping of scrap tires, through social media, brochures, public service announcements and participating in over 100 occasions (20 meetings, 40 events, 50 presentations). The project also helped to increase recycling efforts in some Pharr schools by promoting an environmental education contest and providing 75 recycling bins for school classrooms and 26 larger 95 gallons recycling bins. To continue to learn more about Pharr's Public Work Department and their efforts, please visit: <http://pharr-tx.gov/departments/public-works/pharr-recycling-center/>

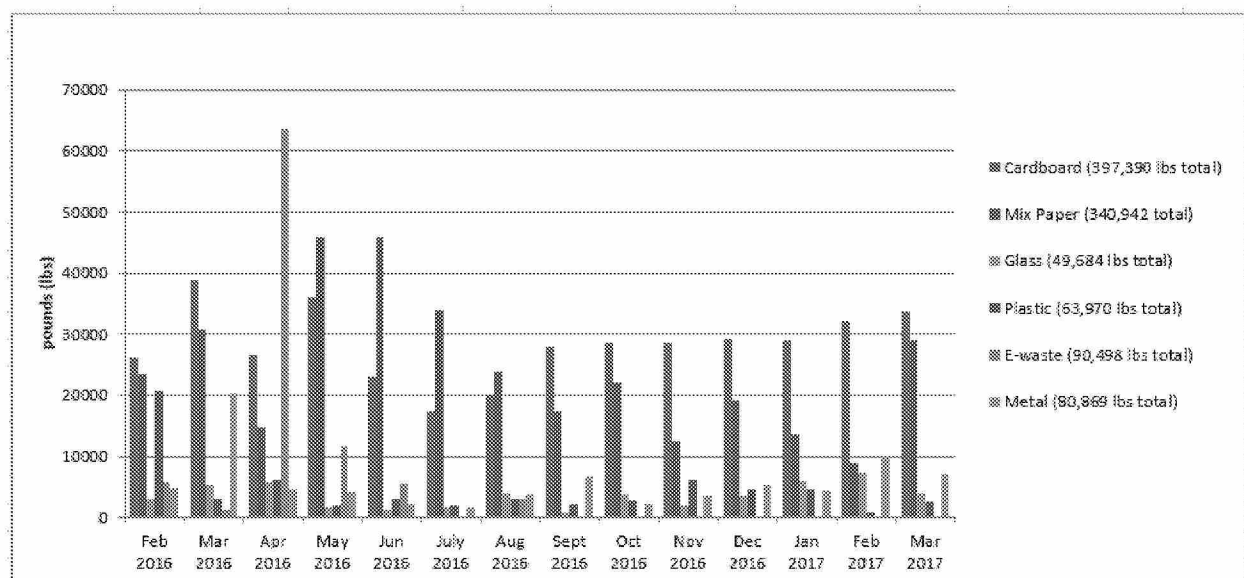


Figure 1. Recyclable Material Collected (lbs/month)

Valle Hermoso and Rio Bravo, Tamaulipas

In 2014, Tamaulipas passed state legislation that outlined the State's Program for Integrated Waste Management and Prevention Program. Within this program, based on many factors such as population growth and solid waste generated per capita, the State prioritized municipalities where it was vital to establish a municipal integrated waste management and prevention program. The State Program outlined specific strategies and actions that these municipal plans should address, including short, medium and long-term implementation and associated costs. The implementation of the municipal plans is done in three phases where the first two phases look at conducting a diagnostic of current conditions regarding solid waste management in municipality and adoption by the municipality to formally present and register the plan through the state. The third phase, is the implementation, monitoring and evaluation of municipal program.

The State Secretariat for Urban Development and Environment in Tamaulipas received a \$20,000 border grant to assist the municipalities of Valle Hermoso and Rio Bravo complete their Diagnostic study which addressed the current situation each has regarding waste management. The diagnostic study, which took place over a two-month period, looked at:

- current operations, staff, equipment, solid waste collected and classification of waste;
- specific strategies recommended to be implemented over a short, medium, long term period;
- costs associated with implementation of strategies (Table 1);
- monitoring program parameters; and
- potential funding mechanisms.

Strategy Considered for Municipality	Total Cost for Municipality to Implement over short, medium and long term (U.S. Dollars*)	
	Rio Bravo	Valle Hermoso
Management/Operations	\$4,776,923	\$1,296,428
Recycling	\$1,648	Not Considered / Not Applicable for Community
General Services	Not Considered / Not Applicable for Community	\$10,989
Public Outreach & Education	\$16,373.63	\$17,032
Private Industry Participation/Partnerships	No cost to municipality	Not Considered / Not Applicable for Community
Institutional Building Capacity	\$155,495	\$122,527
Finance/Legislative	No cost to municipality	Not Considered / Not Applicable for Community

Table1. Total Costs to Implement Short, Medium and Long Term Strategies in Valle Hermoso and Rio Bravo, Tamaulipas

* Based on 2016 Annual Average Exchange Rate of 18.2 Mexican Pesos to \$1 USD

On August 22, 2016, the State of Tamaulipas presented both municipalities with the diagnostic assessment of their current waste management system. In March 2017, Valle Hermoso officially published and registered the Diagnostic assessment with the State, moving into the third phase. Next steps, include the municipality of Rio Bravo's city council approval of the Diagnostic assessment and registration of the program.

Story 2:

Addressing Binationally the Challenges of Electronic Waste in Texas and Coahuila

Rapid advancements in technology and use the use of electronics by consumers mean that more and more rapidly electronic products are becoming obsolete and being disposed of very quickly. Unlike other recyclable materials, electronic waste (e-waste) is not as easily recyclable due to the toxic metals (lead, mercury, cadmium and arsenic) found in them, which can pose a health risk not only to the environmental but public health. The challenge with recycling e-waste, is it is often improperly locally disposed in landfills or there is a lack of infrastructure in communities to properly support handling and properly recycling and is instead exported to areas where it is taken to a landfill.

In 2016, through two Border 2020 grants, one to the Secretary of Environment of the State of Coahuila and the other to the Grupo Ecológico Green Tec-osos of the Instituto Tecnológico de

Piedras Negras, recycling e-waste projects were launched in the communities of Ciudad Acuña, Piedras Negras and Guerrero, in the state of Coahuila and Eagle Pass, Texas address e-waste issues. The combined objectives of these projects were:

- Prevent the electrical and electronic waste generated in the municipalities from being illegally dumped in the Rio Grande riverbed, around the Amistad Dam, as well as in streams, vacant lots and sanitary landfills of the region.
- Inform and educate the population about the benefits of the reuse of electronic products.
- Strengthen the practice of urban mining, consisting of the recovery of metals, materials and other components from electronic waste, avoiding primary extraction, for which it has the support of authorized companies for the collection, separation, selection, recovery and confinement of waste that require it.
- In Ciudad Acuña and Eagle Pass, identify the waste streams of priority electrical and electronic equipment (WEEE) with the aim of developing, in the year 2020, sustainable practices in the handling of materials that reinforce their value in their respective markets.

Overall, both projects yielded the collection of over 113 tons of e-waste and over 448,388 community members were educated and reached through campaigns conducted through workshops and trainings and media (television ads and social media, newspapers, educational bulletins) and with the assistance of over 60 partners (municipalities, education institutes, private industry, non-governmental entities). Last, over 10 permanent e-waste collection centers were established among the four communities.

Goal 5: Enf. Compliance

Legislative Reform and Environmental Education in Nuevo Laredo, Tamaulipas.

The Universidad Autónoma de Tamaulipas received a Border 2020 grant to continue to help educate border communities on the environmental challenges (i.e. water pollution, urban solid waste, fats-oils-grease) that persist in this geographic region. The project focused on the following objectives: following objectives:

1. Educate p school students and environmental municipal inspectors about the most common environmental challenges in the region.
2. Update the municipal environmental legislation for environmental protection Nuevo Laredo and some of the surrounding municipalities and present to the city for adoption.

3. Create an online database with the existing environmental regulations or ordinances of all the border sister cities within EPA Region 6.

The project which was implemented over a 15 month period resulted in the:

- Training of more than 2360 students and 49 directors of several public schools on issues related to environmental conservation.
- Training of 20 environmental inspectors belonging to the Department of Environment and Climate Change of the city of Nuevo Laredo.
- Development and delivery to municipal authorities of the update to a proposed ordinance of "Territorial Ecological Planning of the Municipality of Nuevo Laredo, Tamaulipas.
- The municipalities of Ciudad Mier, Camargo, Jiménez and Jaumave in Tamaulipas adopted environmental ordinances that will benefit approximately 300,000 citizens.